

Zachary Decker

PhD candidate at CU Boulder / NOAA Earth Science Research Laboratory

Senior Editor at Science Buffs

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Education

Current CU at Boulder // National Oceanic and Atmospheric Administration (NOAA)
Physical Chemistry PhD program – GPA: 3.68
Jan 2016 B.A. New College of Florida, Florida's Honors College (NCF)
Concentration: Honors / Physical Chemistry – GPA: narrative evaluations

Publications

Jan 2019 **Decker Z. C. J.**, Zarzana K. J., Coggon M.,..., Brown S.S., Nighttime chemical transformation in biomass burning plumes: a box model analysis initialized with aircraft observations. Environ. Sci. Technol. 2019, 53, 5, 2529-2538. doi:10.1021/acs.est.8b05359

Sep 2020 Zhang L., Lin M., Langford A. O., ..., Brown S.S., **Decker Z. C. J.**, Guillaume Kirgis, and Stephen Conley. Characterizing sources of high surface ozone events in the southwestern U.S. with intensive field measurements and two global models. Atmos. Chem. Phys. doi:10.5194/acp-20-10379-2020

Sep 2018 Stone D., Au K., Sime S., Medeiros D. J., Blitz. M, Seakins P. W., **Decker Z. C. J.**, Sheps L., Unimolecular decomposition kinetics of the stabilised Criegee intermediates CH₂OO and CD₂OO Phys. Chem. Chem. Phys., 2018,20, 24940-24954 doi: 10.1039/c8cp05332d

Mar 2017 **Decker Z. C. J.**, Vereeken L., Au K., Leonid S. Direct Experimental Probing and Theoretical Analysis of the Reaction between the Simplest Criegee Intermediate CH₂OO and Isoprene. Phys. Chem. Chem. Phys., 2017,19, 8541-8551 doi: 10.1039/C6CP08602K

Apr 2017 Womack, C. C., Neuman, J. A., Veres, P. R., Eilerman, S. J., Brock, C. A., **Decker, Z. C. J.**, Zarzana, K. J., Dube, W. P., Wild, R. J., Wooldridge, P. J., Cohen, R. C. & Brown, S. S. Evaluation of the accuracy of thermal dissociation CRDS and LIF techniques for atmospheric measurement of reactive nitrogen species. Atmos. Meas. Tech., 10, 1911–1926, 2017. doi:10.5194/amt-10-1911-2017

Presentations

Dec 2020 Chemical transformation of wildfire smoke at the transition from day to night - Presented at the American Geophysical Union

Nov 2020 Wildfire smoke at the transition from day to night to day - when all oxidants are at play- Presented at the Atmospheric Chemical Mechanisms Conference

Dec 2019 The Study of Nitrate Radical Reactions with Catechol and Phenol by a Dark Oxidation Flow Reactor and Chamber Experiment - Presented at the American Geophysical Union

Dec 2019 Smokin' Chemistry under Moonlight. Determining Air Quality and Climate Impacts from Wildfire Smoke Requires an Investigation of how Smoke Changes Chemically, in the Dark Invited presentation at American Geophysical Union

- Nov/Dec 2018 Nighttime Aircraft Intercepts of Biomass Burning Plumes: Observations & Model Analysis
Presented at the American Geophysical Union **and** the 12th Annual Earth System and Space Science Poster Conference
- Aug 2015 Reaction Kinetics of a Prototypical Criegee Intermediate Formaldehyde Oxide (CH₂OO) with Isoprene – Presented at Sandia National Labs Student Undergraduate Laboratory Internship (SULI) symposium.
- Oct 2014 Reducing CO Emissions: A Bimetallic Nanoparticle Approach
Presented at the South Eastern Regional ACS Meeting

Honors, Awards, Scholarships and Grants

- Graduate Research Award – Cooperative Institute in Environmental Sciences 2019 / 2020
- Outstanding Student Presentation Award – American Geophysical Union - 2018
- 1st place in Atmospheric Chemistry at the 12th Annual Earth System and Space Science - 2018
- Barry Goldwater Scholarship Nominee, New College of Florida (Fall 2015)
- Academic Affairs Research Grant, New College of Florida (Spring, Fall 2014 & Spring 2015)
- Student Research and Travel Grant Award, New College of Florida (Spring 2013 & Jan 2015)

Field Research

- Jul 2019-
Sep 2019 Fire Influence on Regional to Global Environments Experiment - Air Quality (FIREX-AQ)
FIREX-AQ was a major field research campaign with scientists from NOAA, NASA, and universities. My focus during FIREX-AQ was on nighttime smoke plume chemistry. I operated the University of Washington I⁺ Chemical Ionization Mass Spectrometer aboard the NOAA Chemistry Twin Otter aircraft.
- May 2019-
Jun 2019 Monoterpene and Oxygenated aromatics Oxidation at Night and under LIGHTs (MOONLIGHT)
(MOONLIGHT) was a chamber experiment at the National Center for Atmospheric Research (NCAR) designed to study the most important chemical reactions that take place in wildfire smoke. I operated the NOAA 6-channel Cavity Ringdown Instrument to measure Nitrogen Oxides, NO₃, N₂O₅ and O₃.
- Jun 2017-
Jul 2017 Fires, Asian, and Stratospheric Transport-Las Vegas Ozone Study (FAST-LVOS)
FAST-LVOS was a field research campaign to better understand the causes of high-ozone events in Clark County, with emphasis on characterizing the roles of emissions from regional wildfires and pollution from southern California. I operated the NOAA 4-channel Cavity Ringdown Instrument to measure Nitrogen Oxides and O₃.

Research Background

- Jan 2018-
Current Nighttime Biomass Burning Smoke Plume Chemistry
Focused on understanding how wildfire and agricultural smoke plumes impact urban air quality. These efforts are ongoing and include modeling, laboratory and field studies including FIREX-AQ field studies and MOONLIGHT chamber experiments.
- May 2017-
Dec 2017 Study of NO_x, NO_y, O₃ in the Fires, Asian, and Stratospheric Transport Las Vegas O₃ Study
I operated and maintained a custom cavity ring-down field instrument from the Brown group at NOAA to detect and measure NO, NO₂, NO_y, and O₃ atop Angel Peak in Las Vegas Nevada as well as reduced and finalized all data.

- May 2016-
Aug 2016 Characterization of a thermal dissociation oven toward NO_y detection
In Dr. Steven Brown's group I Investigated the NH₃ interference for quartz and Mo thermal dissociation inlets (TDIs) in outside ambient conditions at NOAA Boulder. The TDIs are designed to convert NO_y to NO₂ for detection by cavity ring down spectroscopy.
- May 2015-
Aug 2016 Reaction Kinetics of Isoprene with Formaldehyde Oxide (CH₂OO)
Worked with Drs. Leonid Sheps and Luc Vereeken to elucidate the reaction kinetics of CH₂OO and isoprene using time resolved cavity enhanced absorption spectroscopy and *ab-initio* theoretical techniques.
- Aug 2013-
May 2015 Design and Synthesis of a Novel N,N,O Ligand as a RuBisCo Active Site Analogue
Under Dr. Suzanne Sherman at NCF, I designed and attempted the synthesis of a novel scorpionate ligand as a RuBisCo active site analogue for carbon fixation.
- May 2014-
May 2015 Investigating CO Oxidation by Bimetallic Nanoparticles using Gas Chromatography
Worked in the lab of Dr. Fabien Goulay at West Virginia University to synthesize and characterize bimetallic nanoparticles toward CO oxidation to improve cold start catalytic convert performance.
- Feb 2015-
May 2015 Temperature Varied Microwave Spectroscopy
Under the direction of Dr. Shipman at NCF, I lead a group of peers to investigate temperature varied experiments using a chirped pulse FTMW spectrometer.
- Jan 2013-
May 2013 Room Temperature Microwave Spectroscopy
As part of an independent study project, a group of peers and I recorded the room temperature microwave spectra of nitromethane.

Professional Experience

- Aug 2017
Current Tutor of General, Organic, Analytical and Physical Chemistry
I actively tutor college and high school students in various chemistry topics and courses.
- Aug 2016
May 2017 TA Analytical Chemistry (CHEM 4171) / General Chemistry (CHEM 1113/4), CU Boulder
Managed two lab sections, two recitations, graded lab reports, and proctored exams.
- Sep 2014-
Mar 2016 Chemistry Tutor, Quantitative Resource Center, New College of Florida
Peer tutored students in chemistry including general, organic, inorganic and physical.
- Mar 2014-
Mar 2016 Chemistry/Math Tutor and SAT/ACT Teacher, IMG Academy
Taught SAT/ACT prep courses as well as tutored chemistry and math.
- Aug 2015-
Dec 2015 TA Organic Chemistry, New College of Florida
Held TA sessions, met with individual students and graded exams.
- Aug 2015-
Dec 2015 Student Writing Assistant, Writing Resource Center, New College of Florida
Met with students one on one to edit/critique lab reports and other written work.
- Aug 2013-
May 2014 TA General Chemistry I & II, New College of Florida
Ran TA sessions, met with individual students, graded homework.
- Oct 2009-
May 2012 President, IB Literary Magazine, Pensacola, Florida
Lead 40 members in design and publishing, raising \$4,000 for charity.

Volunteer Work

- Aug 2019-
 Current Officer in the Hiking Club at CU
The Hiking Club (CUHC) is a non-profit that leads hikes across Colorado and surrounding states suitable for all hiking skill levels. CUHC also provides educational opportunities on environmental issues and promotes outdoor stewardship. Officers act as hiking guides for day hikes, overnight trips, and weeklong backpacks to build community at CU and respect for the outdoors.
- May 2017-
 Current Senior Editor at Science Buffs (ScienceBuffs.org)
Science Buffs is a CU Boulder group dedicated to science outreach by communicating CU science to the community.
- Dec 2018 CU Wizards – The power of air
Participated as a “co-wizard” in a 1-hour live CU Wizards show about the “power of air” to communicate atmospheric chemistry to grade school student through several chemistry demonstrations.
- Sep 2014-
 May 2015 Chemistry Outreach Group
Organized and carried out chemistry demonstrations to elementary level “tracked to fail” students in addition to homework help in math and science.
- Jan 2014-
 Mar 2016 Manatee Regional Science and Engineering Fairs
Judged for high school, middle school, and elementary school chemistry/physics projects.